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ADVANCED COMMAND AND CONTROL (C2) APPLICATIONS INTERFACES TO THE ADVANCED COMMUNICATIONS TECHNOLOGY SATELLITE (ACTS)

ATZL-CDB   16 May 1994

MEMORANDUM FOR Office of the Under Secretary of Defense (Acquisition), Defense
Technical Information Center (DTIC), ATTN: DTIC-OCC, Cameron Station, Alexandria,
Virginia 22304-6145

SUBJECT: Distribution Statements on Technical Documents

1. Reference DoD Directive 5230.24, Distribution Statements on Technical Documents,
18 Mar 87.

2. The following distribution statement is assigned to the attached Final Report, 26 Apr
94, Advanced Command and Control Applications Interfaces to the Advanced
Communications Technology Satellite (ACTS), DABT 65-93-D-0002, and returned to
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                                        CALVIN S. JOHNSON
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INTRODUCTION

1.1 PURPOSE

This report documents the equipment, software configuration, physical connections, and procedures required to interface advanced C^2 applications with the Advanced Communications Technology Satellite (ACTS) Very Small Aperture Terminal (VSAT).

1.2 SCOPE

This document describes how to interface the PictureTel 4000, Model 200E, video teleconferencing (VTC) system, the Warrior intelligence processor, Multiple Subscriber Equipment (MSE), and multispectral imagery (MSI) with the ACTS VSAT. Additionally, it also details the communications link from the Leader Development Center (LDC) to the Battle Command Battle Lab (BCBL) at Ft. Leavenworth, Kansas.

1.3 METHODOLOGY

Sections 2 through 4 of this report describe the interface of one or more advanced C^2 applications with the ACTS VSAT. Each section includes a list of the equipment required for the interface and how to make the physical connections. As appropriate, the section also provides a list of the necessary software and describes its configuration. This information is presented as a step-by-step process. Following this process should result in a successful interface of a given C^2 application with the VAST.

The last section depicts the communications path from the VSAT at the LDC to the C^2 applications at the BCBL.

SECTION 2

VIDEO TELECONFERENCING (VTC) INTERFACE

2.1   PURPOSE

This section describes how to interface the PictureTel 4000 VTC system with the ACTS VSAT. The procedures to accomplish this are presented below as a step-by-step process.

2.2   EQUIPMENT

The first step to interface the VTC system to the VSAT is to gather the peripheral equipment. The following equipment is required :

- TyLink ONS 400 T1 CSU (Channel Server Unit)

- One RS-449 cable with one male and one female DB37 connector

- PictureTel 4000, Model 200E VTC system which consists of:

    - Camera module

    - Monitor

    - Compression-decompression (Codec) board

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-       **Control panel**

-       **Speakers**

-       **Optional: document camera.**

2.3   SATELLITE LINK

The next step in the interfacing process is to establish the ACTS link. Either the distant end or the near end of the system can establish the link. If the near end will establish the link, follow the steps outlined below:

- Lift up the receiver of one of the phones connected to the VSAT

- Dial the following sequence: 20 1100 * 8 * ## * CCCC*, where:

    -       ## = the station number of the distant end

    -       CCCC = the first channel in use by the distant end (contact the distant end to get the first channel they are using--usually this is 1100)

- Wait for the two-tone acknowledgement to sound

- Hang up the receiver.

2.4   PHYSICAL CONNECTIONS

The third step in the process is to make the physical connections. The PictureTel 4000, Model 200E VTC system comes already assembled in a cabinet. All that you need to do is to connect it to the CSU and apply power. (Should you desire to remove the components from the cabinet, see Figure 2-1 for the physical connections required to interface the system with the VSAT.) Follow the steps listed below to complete the physical connections:

- Connect the RS-449 cable to port 1 of the Codec and to channel 1 of the CSU (Note: To connect cables to the rear of the CSU, you must temporarily remove the cooling fan at the rear of the transit case holding the CSU. Be sure that you turn off the power to the transit case and unplug the power cord to eliminate any electrical hazard. Once you complete the cabling to the CSU, replace the cooling fan.)

- Plug in the Codec power cord

- Turn on the Codec

- The PictureTel will go through a self-test lasting several minutes. When it is complete, it will display a "PICTURETEL READY" prompt.

Physical Connections for VTC
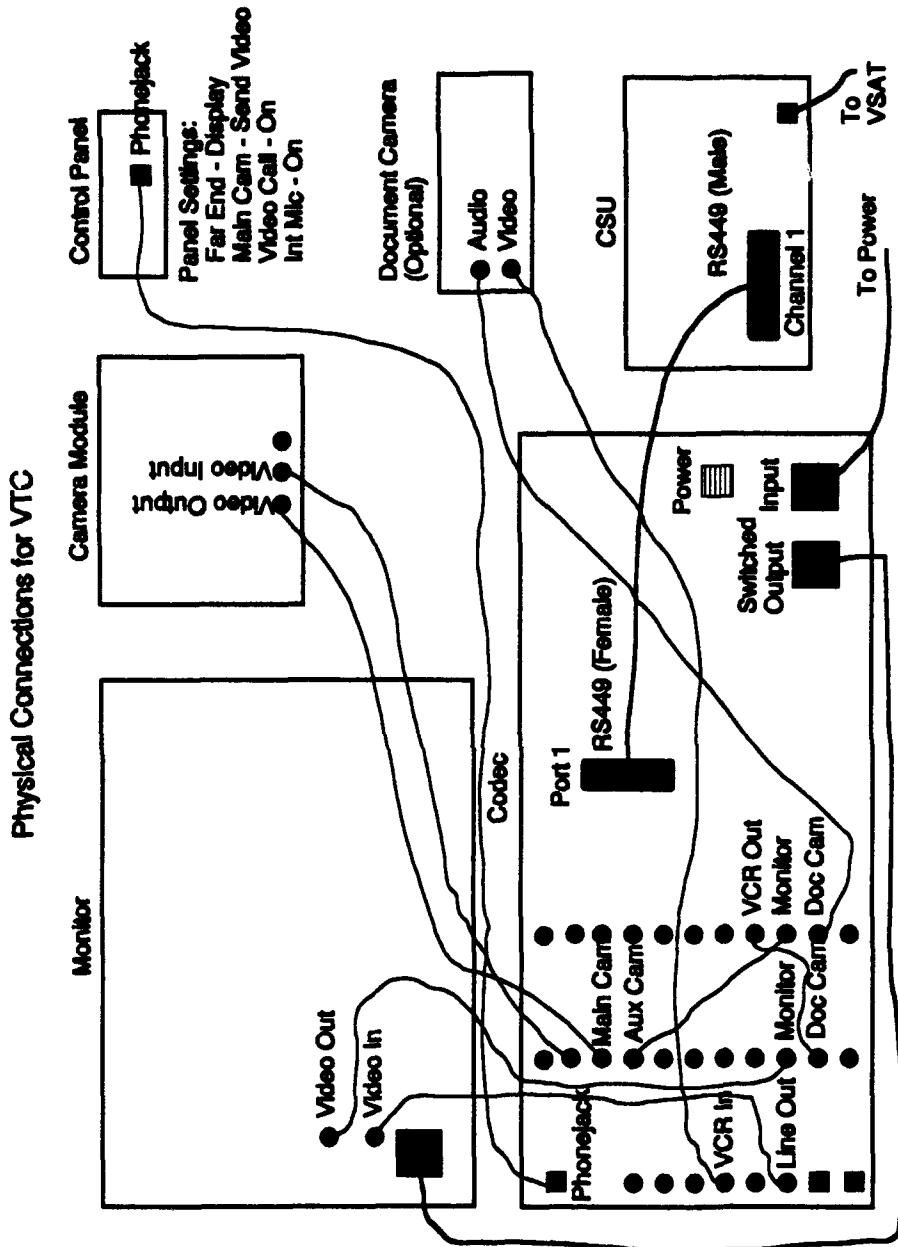
Figure 2-1 VTC Interface Physical Connections

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2.5   CSU CONFIGURATION

The next step is to configure the CSU for use with the VTC system. Use the following procedure:

- Plug in and turn on the CSU

- Using the arrows on the CSU keypad, scroll down one level from the startup display (**TYLINK ONS 400 T1 CSU**) and then scroll right until **MOD CONFIG MENU** is visible

- Scroll down one level and then right until **CHANNEL CONFIG** appears

- Scroll down one level and then either left or right until **CH #1** is shown (if it is not already displayed)

- Scroll down one level to **CH DENSITY** then right until **NONE (CLR CH)** is displayed (if it is not already displayed)

- Scroll down one level to **CH DATA RATE** then right until **512K** is visible (if it is not already displayed)

- Scroll down one level to **STARTING DS0 NUM** then right until **DS-0:   1** appears (if it is not already displayed)

- Scroll down one level to **CH TIMING** then right until **LOOP 2** is shown (if it is not already displayed)

- Scroll down one level to **CLOCK INV** then right until **OFF** is displayed (if it is not already displayed)

- Scroll down one level to **DATA INV** then right until **OFF** is visible (if it is not already displayed)

- Scroll up to **CHANNEL CONFIG**

- Scroll right once to **UPDATE CONFIG** then down two levels to **TO UPDATE CONFIG**

- Press **ENTER** (the center button)

- Scroll up to the startup display.

2.6   PICTURETEL CONFIGURATION

The final step is to encrypt the PictureTel. If the **ENCRYPTION** light is not already lit on the control panel, follow the steps below:

- Press **MENU** on the control panel

- Arrow down to **CONFIGURATION MENU** and press **ENTER**

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- Arrow down to **SET ENCRYPTION** and press **ENTER**

- Arrow down to **EXTERNAL** and press **ENTER**

- Type 1 2 3 for the password and press **ENTER**

- Press **MENU** on the control panel

- Arrow up to **PREVIOUS MENU** and press **ENTER**

- Arrow up to **EXIT MENU** and press **ENTER** ,

Ensure that the distant end also has the **ENCRYPTION** light on for the system to work properly.

2.7 TEAR DOWN

Once the VTC session is complete, you may want to "tear down" the ACTS link. Either the distant end or the near end can tear down the ACTS link. If the near end will tear down the link, follow the steps outlined below:

- Lift up the receiver of one of the phones connected to the VSAT

- Dial the following sequence: 40 1100 *

- Wait for the two-tone acknowledgement to sound <u>twice</u>

- Hang up the receiver.

SECTION 3

MULTISPECTRAL IMAGERY (MSI)
AND
WARRIOR INTERFACE

3.1   PURPOSE

This section describes how to interface MSI and the Warrior intelligence processor with the ACTS VSAT. The procedures to accomplish this are presented below as a step-by-step process.

3.2   EQUIPMENT

The first step to interface either MSI or Warrior to the VSAT is to gather the peripheral equipment.

3.2.1   MSI

The following equipment is required to interface MSI to the VSAT:

- TyLink ONS 400 T1 CSU (Channel Server Unit)

- Two RS-449 cables, one with a DB37 male connector and a round 37-pin female military connector, and one with a DB50 male connector and a round 37-pin female military connector

- KG-194A trunk encryption device

- Communications security (COMSEC)-key loading device (i.e., KYK-13 or KOI-18)

- Cisco IGS/R internet router

- RS-232 cable with male and female DB25 connectors

- Ethernet LAN cable with two T-barrel connectors and two coaxial-cable-to-RS-232 connectors

- Digital test set with interface cable

- Sun SPARCStation with a Vitec RasterFlex-32 graphics card installed and ERDAS 7.5 and Imagine 8.02 software preloaded.

3.2.2   Warrior

To interface Warrior to the VSAT requires:

- TyLink ONS 400 T1 CSU

- Two RS-449 cables, one with a DB37 male connector and a round 37-pin female military connector, and one with a DB50 male connector and a round 37-pin female military connector

- KG-194A trunk encryption device

- Communications security (COMSEC)-key loading device (i.e., KYK-13 or KOI-18)

- Cisco IGS/R internet router

- RS-232 cable with male and female DB25 connectors

- Ethernet LAN cable with two T-barrel connectors and two coaxial-cable-to-RS-232 connectors

- Digital test set with interface cable

- Warrior workstation with software preloaded.

3.3   SATELLITE LINK

The next step in the interfacing process is to establish the ACTS link. Either the distant end or the near end of the system can establish the ACTS link. If the near end will establish the link, follow the steps outlined below:

- Lift up the receiver of one of the phones connected to the VSAT

- Dial the following sequence: 20 1108 * N * ## * CCCC*, where:

- N = the number of channels (for a data rate of 512K, N = 8. You may choose any data rate--in multiples of 64K--as long as you use no more than 24 channels. For a higher or lower data rate, figure a data rate of 64K per channel. The higher the data rate, the faster the data transfer and the larger the error rate)

- ## = the station number of the distant end

- CCCC = the first channel in use by the distant end (contact the distant end to get the first channel they are using--usually this is 1108)

- Wait for the two-tone acknowledgement to sound

- Hang up the receiver.

3.4 PHYSICAL CONNECTIONS

The third step in the process is to make the physical connections. See Figure 3-1 for the physical connections required to interface MSI or Warrior with the VSAT. (Note: To connect cables to the rear of the CSU, you must temporarily remove the cooling fan at the rear of the transit case holding the CSU. Be sure to turn off the power to the transit case and unplug the power cord to eliminate any electrical hazard. Replace the cooling fan once you have connected the cables to the CSU.)

Physical Connections for MSI or Warrior

KG-194A

RS-449

CSU

DB 37

RS-449

To VSAT

Cisco Router

MSI or Warrior
Workstation

Coax and barrel
connectors

RS-232

Ethernet

Ethernet
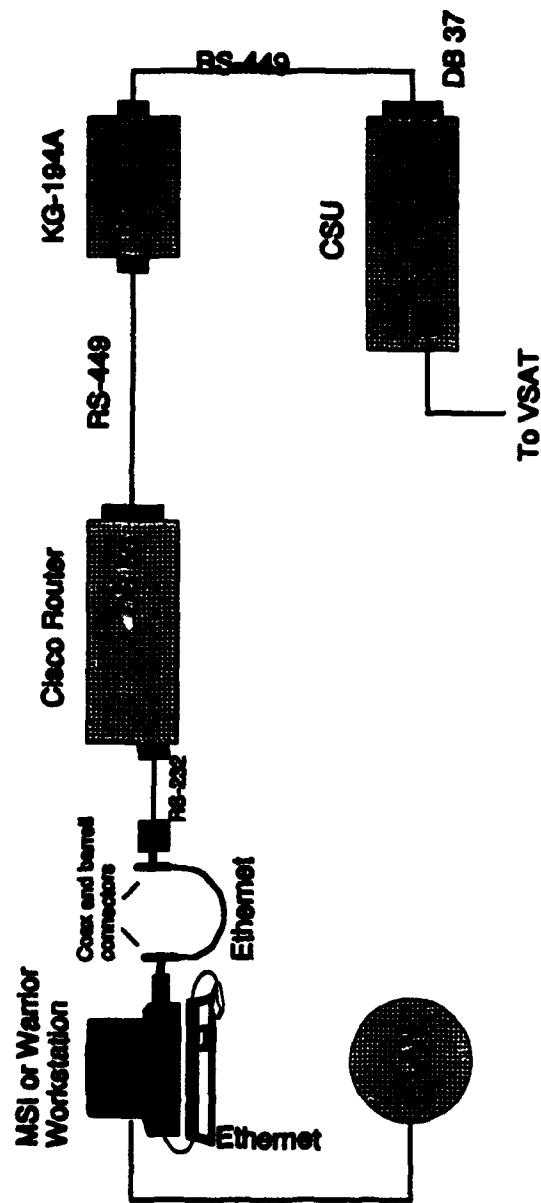
Figure 3-1 MSI and Warrior Interface Physical Connections

3.5   SOFTWARE CONFIGURATION

3.5.1   <u>CSU</u>

The next step is to configure the CSU by following the steps outlined below:

- Plug in and turn on the CSU

- Using the arrows on the CSU keypad, scroll down one level from the startup display (**TYLINK ONS 400 T1 CSU**) and then right until **MOD CONFIG MENU** is visible

- Scroll down one level and then right until **CHANNEL CONFIG** appears

- Scroll down one level and then either left or right until the **CH #2** is shown (if it is not already displayed)

- Scroll down one level to **CH DENSITY** then right until **NONE (CLR CH)** is displayed (if it is not already displayed)

- Scroll down one level to **CH DATA RATE** then right until **512K** is visible (if it is not already displayed.) (Note: you may choose any data rate, as long as the sum of the data rates on all four channels of the CSU add up to less than or equal to 1536K. The higher the rate, the faster the data transfer and the larger the error rate. The data rate you choose must also correspond to the rate used in section 3.3.)

- Scroll down one level to **STARTING DS0 NUM** then right until **DS-0:** **9** appears (if it is not already displayed)

- Scroll down one level to **CH TIMING** then right until **LOOP 2** is shown (if it is not already displayed)

- Scroll down one level to **CLOCK INV** then right until **OFF** is displayed (if it is not already displayed)

- Scroll down one level to **DATA INV** then right until **OFF** is visible (if it is not already displayed)

- Scroll up to **CHANNEL CONFIG**

- Scroll right once to **UPDATE CONFIG** then down two levels to **TO UPDATE CONFIG**

- Press **ENTER** (the center button)

- Scroll up to the startup display.

3.5.2   Cisco Router

Now you should configure the Cisco router. Connect the digital test set to the **CONSOLE** port of the Cisco router and apply power to the test set. To configure the router, follow the steps listed below:

- Press the **F6** key

- Press the **F1** key

- Press the **RUN** key

- At the blinking cursor, press **ENTER**. The prompt "**SPOCK SW >**" should appear

- Type **SHO INT** and press **ENTER**

- Type **MORE** and press **ENTER**

- Type **ENABLE** and press **ENTER**

- Type **ENTERPRISE** as the password and press **ENTER**. The prompt "**SPOCK SW#**" should appear

- Type **SETUP** and press **ENTER**

- Continue to press **ENTER** until the prompt, "**IS THIS INTERFACE IN USE?**" appears; press **ENTER** again

- Type in the Ethernet IP address (contact the LAN manager for this information) and press **ENTER**

- Continue to press **ENTER** until the prompt "**IS THIS INTERFACE IN USE?**" is displayed again; press **ENTER** again

- Type in the Serial IP address (contact the LAN manager for this information) and press **ENTER**

- Press **ENTER** until the prompt "**USE THIS CONFIGURATION? [YES/NO]**" appears

- Type **YES** and press **ENTER**

- Type **WR MEM** (to save the configuration) and press **ENTER**

- Type **DISABLE** and press **ENTER**. The prompt "**SPOCK SW >**" should appear

- Press **MENU** until the main menu is displayed

- Disconnect the digital test set from the router.

3.5.3   <u>KG-194A Configuration</u>

The last configuration step is to load the KG-194A. To load the COMSEC-key into the KG-194A, first put the CSU in loopback. To do this, follow the steps listed below:

- Using the arrows on the CSU keypad, scroll down one level from the startup display (**TYLINK ONS 400 T1 DSU/CSU**) and then right twice until **DIAGNOSTICS MENU** is visible

- Scroll down once to **CH LED DISPLAY CHANNEL #** is displayed

- Scroll right until it reads **CHANNEL 2**

- Scroll down once to **LOCAL CH#__ LPBK** and then right until **CH#2** is displayed

- Set to **ON VIA LOCAL** by pressing the **ENTER** key (the center button)

- The red test light on the front of the CSU should now be lit.

Next, load the COMSEC-key into the KG-194A and set the update number by following the steps below:

- The KG-194A should be "zeroized" (i.e., the **UPDATE** display should read **00** and the red alarm light should be lit.) If it isn't, turn the selector knob to **ZEROIZE** and turn the system off and then back on

- Connect the COMSEC-key loading device to the KG-194A

- Set the selector knob to **LOAD**

- While pressing the **ACTUATE** button, load the COMSEC-key

- Release the **ACTUATE** button. The green **PARITY** light should now be lit. If it isn't, zeroize the KG-194A and reload, using the previous steps

- Set the selector knob to **CHNG KEY** and press the **ACTUATE** button. The **RESYNC** and **FULL OPR** lights should now be lit

- Set the **UPDATE** display to the day's date by pressing the **ACTUATE** button repeatedly until the correct number is displayed. Pause between each number to allow the system to resync. If you accidentally go past the day's date, you must zeroize the system and reload it

- Set the selector knob to **RESTART** and press the **ACTUATE** button

- Disconnect the COMSEC-key loading device.

3.6   MSI and WARRIOR WORKSTATIONS

The final step in the process is to link the workstations over the satellite link. To do this, follow the steps outlined below:

- When the distant end is ready, take the CSU out of loopback by pressing the center button (the **ENTER** key) on the CSU. **LOCAL CH#2 LPBK OFF** should now be displayed and the red test light on

the front of the CSU should be unlit (unless another channel is also in loopback)

- Turn the router off for a few seconds and then back on

- Either the distant or near end should then press the ACTUATE button on the KG-194A to resync

- Have the workstation operator connect to the router and then "ping" the distant end. (<u>Note</u>: Only system operators/administrators should configure and operate the MSI or Warrior workstations.)

3.7   TEAR DOWN

Once the *MSI or Warrior session is complete,* you may want to "tear down" the ACTS link. Either the distant end or the near end can tear down the ACTS link. If the near end will tear down the link, follow the steps outlined below:

- Lift up the receiver of one of the phones connected to the VSAT

- Dial the following sequence: 40 1108 *

- Wait for the two-tone acknowledgement to sound <u>twice</u>

- Hang up the receiver.

SECTION 4

MOBILE SUBSCRIBER EQUIPMENT (MSE) INTERFACE

4.1   PURPOSE

This section describes how to interface MSE with the ACTS VSAT. The procedures to accomplish this are presented below as a step-by-step process.

4.2   EQUIPMENT

The first step to interface MSE to the VSAT is to gather the peripheral equipment. The following equipment is required:

- TyLink ONS 400 T1 CSU (Channel Server Unit)

- RS-442 to RS-449 adapter cable

- Redondo Di-Phase Converter

- PCM CX-11230 cable with a split-tail male end

- MSE small extension node (SEN)

- 2-pair cable

- 26-pair cable

- J-1077 Junction Box Terminal

- DNVT telephone.

4.3   SATELLITE LINK

The next step in the interfacing process is to establish the ACTS link. Either the distant end or the near end can establish the ACTS link. If the near end will establish the link, follow the steps outlined below:

- Lift up the receiver of one of the phones connected to the VSAT

- Dial the following sequence: 20 1116 * 4 * ## * CCCC*, where:

  - ## = the station number of the distant end

  - CCCC = the first channel in use by the distant end (contact the distant end to get the first channel they are using--usually this is 1116)

- Wait for the two-tone acknowledgement to sound

- Hang up the receiver.

4.4 PHYSICAL CONNECTIONS

The third step in the process is to make the physical connections. See Figure 4-1 for the physical connections required to interface MSE with the VSAT. (Note: To connect cables to the rear of the CSU, you must temporarily remove the cooling fan at the rear of the transit case holding the CSU. Be sure to turn off the power to the transit case and unplug the power cord to eliminate any electrical hazard. Once you have connected the cables to the CSU, replace the cooling fan.)

4.5 CSU CONFIGURATION

The next step is to configure the CSU using the following the steps:

- Plug in and turn on the CSU

- Using the arrows on the CSU key-pd, scroll down one level from the startup display (**TYLINK ONS 400 T1 CSU**) and then scroll right until **MOD CONFIG MENU** is visible

- Scroll down one level and then right until **CHANNEL CONFIG** appears

- Scroll down one level and then either left or right until **CH #3** is shown (if it is not already displayed)

- Scroll down one level to **CH DENSITY** then right until **NONE (CLR CH)** is displayed (if it is not already displayed)
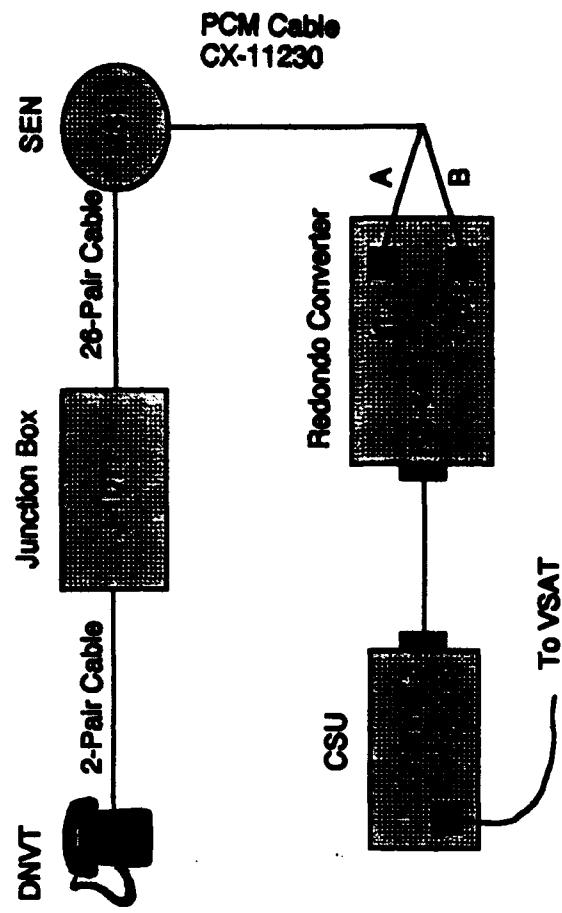
Figure 4-1   MSE Interface Physical Connections

- Scroll down one level to **CH DATA RATE** then right until **256K** is visible (if it is not already displayed)

- Scroll down one level to **STARTING DS0 NUM** then right until **DS-0:   17** appears (if it is not already displayed)

- Scroll down one level to **CH TIMING** then right until **LOOP 2** is shown (if it is not already displayed)

- Scroll down one level to **CLOCK INV** then right until **OFF** is displayed (if it is not already displayed)

- Scroll down one level to **DATA INV** then right until **OFF** is visible (if it is not already displayed)

- Scroll up to **CHANNEL CONFIG**

- Scroll right once to **UPDATE CONFIG** then down two levels to **TO UPDATE CONFIG**

- Press **ENTER** (the center button)

- Scroll up to the startup display.

4.6   TEAR DOWN

Once the MSE session is complete, you may want to "tear down" the ACTS link. Either the distant end or the near end can tear down the ACTS link. If the near end will tear down the link, follow the steps outlined below:

- Lift up the receiver of one of the phones connected to the VSAT

- Dial the following sequence: 40 1120 *

- Wait for the two-tone acknowledgement to sound <u>twice</u>

- Hang up the receiver.

SECTION 5

VSAT TO APPLICATIONS COMMUNICATIONS LINK

5.1   PURPOSE

This section depicts the communications link from the ACTS VSAT terminal at the LDC to the C^2 applications at the BCBL at Ft. Leavenworth. It describes the cabling, connectors, "pin-outs," devices, and physical locations of the communications path from the VSAT to the C^2 applications.

5.2   THE LINK

Figure 5-1 depicts the communications link from the VSAT to the fiber-optic cable leading from the LDC. Figure 5-2 shows the path from the fiber-optic cable leading to the BCBL and, thence, to the C^2 applications.

Figure 5-1 LDC to BCBL Link
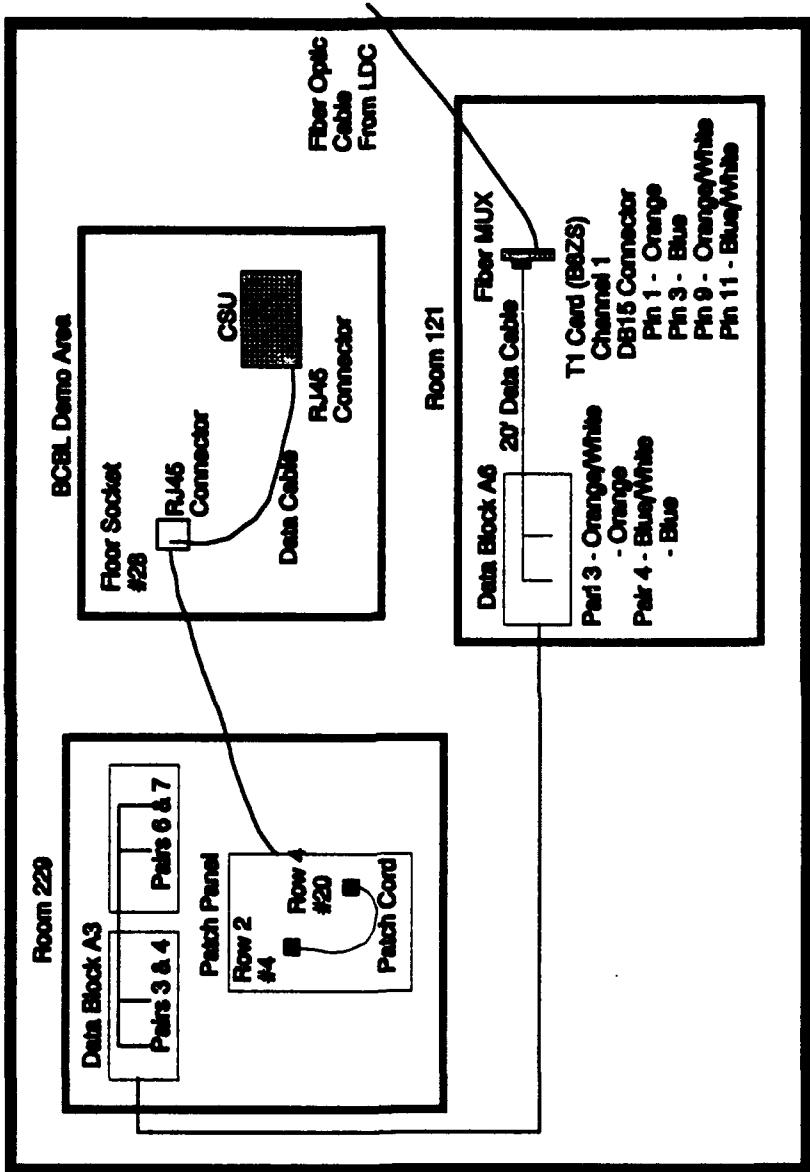
Figure 5-2 LDC to BCBL Link (Cont)